

I. PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-028280

(43)Date of publication of application : 30.01.1996

(51)Int.Cl.

F02B 29/08

F02B 31/02

F02D 13/02

F02M 69/00

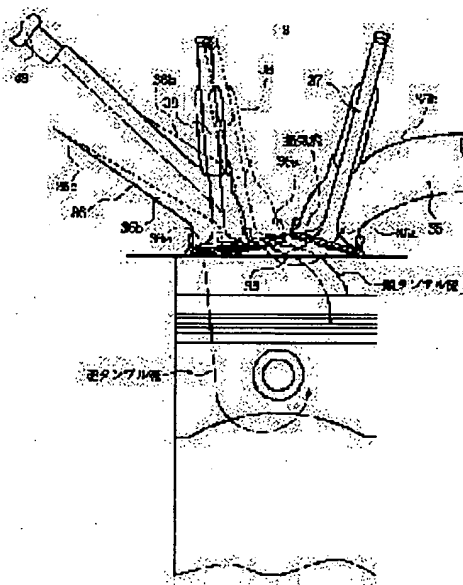
(21)Application number : 06-190898

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(22)Date of filing : 21.07.1994

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(54) INTAKE DEVICE FOR ENGINE HAVING SUPERCHARGER



(57)Abstract:

PURPOSE: To improve scavenging efficiency and to improve knocking resistance by reducing the temperature of a combustion chamber in a way that residence gas in a combustion chamber is scavenged by means of supercharging air.

CONSTITUTION: The intake device of an engine 2 having a supercharger comprises an exhaust passage 35 having an exhaust opening part 35a opened to a combustion chamber 33; an exhaust valve 37 to open and close the exhaust opening part 35a; an intake passage 36 having three or more intake opening parts 36a opened to the combustion chamber 33; and an intake valve 38 to open and close the respective intake opening parts 36a. Further, a supercharger to feed supercharging air to the intake passage 36 is provided. A control means to suppress a reverse tumble flow from the intake valve 38 positioned at a central part at a valve overlap period T2 in which the intake valve 38 and the exhaust valve 37 are simultaneously opened is provided and supercharging air

is fed through operation of a supercharger.

CLAIMS

[Claim(s)]

[Claim 1] Form in a combustion chamber the flueway which has exhaust air opening which carried out opening, and the exhaust valve which opens and closes said exhaust air opening is prepared. In an engine equipped with the supercharger which, on the other hand, forms in a combustion chamber the inhalation-of-air path which has three or more inhalation-of-air openings which carried out opening, prepares the inlet valve which opens and closes said each inhalation-of-air opening, and supplies supercharge air to said inhalation-of-air path further While said inlet valve and said exhaust valve equip the valve-overlap period currently opened to coincidence with a control means to control the reverse tumble flow from an inlet valve located in said center The suction system of an engine equipped with the supercharger characterized by making as [supply / by actuation of said supercharger / supercharge air].

[Claim 2] Form in a combustion chamber the flueway which has exhaust air opening which carried out opening, and the exhaust valve which opens and closes said exhaust air opening is prepared. In an engine equipped with the supercharger which, on the other hand, forms in a combustion chamber the inhalation-of-air path which has three or more inhalation-of-air openings which carried out opening, prepares the inlet valve which opens and closes said each inhalation-of-air opening, and supplies supercharge air to said inhalation-of-air path further Phase contrast is given to the closing motion timing of an inlet valve located in said center, and the closing motion timing of an inlet valve located in said side. The suction system of an engine equipped with the supercharger characterized by making as [supply / said inlet valve and said exhaust valve / by actuation of said supercharger / at the valve-overlap period currently opened to coincidence / supercharge air].

[Claim 3] The suction system of an engine equipped with the supercharger according to claim 1 or 2 characterized by setting up a valve-overlap period with the inlet valve which carries out closing motion timing of an inlet valve located in said side early, gives phase contrast, and is located in said side from the closing motion timing of an inlet valve located in said center, and said exhaust valve.

[Claim 4] The suction system of the engine which equips said inhalation-of-air path with the fuel injector which injects a fuel, and is equipped with the supercharger according to claim 1 to 3 characterized by starting the fuel injection of this fuel injector from near at the termination time of said bulb overlap period.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the suction system of an engine equipped with the supercharger which performs air compression with a supercharger.

[0002]

[Description of the Prior Art] For example, for example, an inhalation-of-air system is equipped with a supercharger, inhalation air is compressed with this supercharger, inhalation of more air is enabled, a charging efficiency is raised in an engine, and there are some which aim at improvement in an output in it.

[0003] Moreover, the flueway which has exhaust air opening which carried out opening is formed in a combustion chamber, the exhaust valve which opens and closes exhaust air opening is prepared, on the other hand, the inhalation-of-air path which has three or more inhalation-of-air openings which carried out opening is formed in a combustion chamber, there are some which prepared the inlet valve which opens and closes each inhalation-of-air opening, and some which perform scavenging are in the valve-overlap period which this inlet valve and exhaust valve are opening to coincidence.

[0004]

[Problem(s) to be Solved by the Invention] By the way, with an engine equipped with a supercharger, since an intake-air temperature rises by air compression, since it is easy to generate knocking compared with a non-supercharged engine, a compression ratio is not raised, but there are problems -- about the same fuel consumption as a non-supercharged engine is not obtained.

[0005] Moreover, the inhalation-of-air path which has three or more inhalation-of-air openings which carried out opening is formed in a combustion chamber, the reverse tumble flow from inhalation-of-air opening located in the center which contributes to scavenging in what prepared the inlet valve which opens and closes each inhalation-of-air opening, and the order tumble flow from inhalation-of-air opening located in the side become reverse, and since a tumble flow occurs in the direction negated mutually, both cannot perform effective scavenging.

[0006] For this reason, although it is possible to give phase contrast to the closing motion timing of the inlet valve located in the center, and the inlet valve located in the side, for example, to strengthen the order tumble flow of the side, and to generate a strong scavenging-air style, if the residual gas of a combustion chamber can be scavenged with supercharge air at this time, for example, a bulb overlap period, the temperature of a combustion chamber can be lowered and knocking-proof nature can be raised.

[0007] This invention is scavenging the residual gas of a combustion chamber with

supercharge air, lowers the temperature of a combustion chamber and aims at offering the suction system of an engine equipped with the supercharger which raises knocking-proof nature while being made in view of this point and raising scavenging efficiency. [0008]

[Means for Solving the Problem] In order to solve said technical problem, invention according to claim 1 Form in a combustion chamber the flueway which has exhaust air opening which carried out opening, and the exhaust valve which opens and closes said exhaust air opening is prepared. In an engine equipped with the supercharger which, on the other hand, forms in a combustion chamber the inhalation-of-air path which has three or more inhalation-of-air openings which carried out opening, prepares the inlet valve which opens and closes said each inhalation-of-air opening, and supplies supercharge air to said inhalation-of-air path further While said inlet valve and said exhaust valve equip the valve-overlap period currently opened to coincidence with a control means to control the reverse tumble flow from an inlet valve located in said center, it is characterized by making as [supply / by actuation of said supercharger / supercharge air].

[0009] Invention of claim 2 forms in a combustion chamber the flueway which has exhaust air opening which carried out opening. Prepare the exhaust valve which opens and closes said exhaust air opening, and, on the other hand, the inhalation-of-air path which has three or more inhalation-of-air openings which carried out opening is formed in a combustion chamber. In an engine equipped with the supercharger which prepares the inlet valve which opens and closes said each inhalation-of-air opening, and supplies supercharge air to said inhalation-of-air path further Phase contrast is given to the closing motion timing of an inlet valve located in said center, and the closing motion timing of an inlet valve located in said side. It is characterized by making as [supply / said inlet valve and said exhaust valve / by actuation of said supercharger / at the valve-overlap period currently opened to coincidence / supercharge air].

[0010] From the closing motion timing of an inlet valve located in said center, the suction system of an engine equipped with the supercharger of invention according to claim 3 carries out closing motion timing of an inlet valve located in said side early, gives phase contrast and is characterized by setting up a valve-overlap period with the inlet valve located in said side, and said exhaust valve.

[0011] The suction system of an engine equipped with a supercharger according to claim 4 equips said inhalation-of-air path with the fuel injector which injects a fuel, and is characterized by starting the fuel injection of this fuel injector from near at the termination time of said bulb overlap period.

[0012]

[Function] In invention according to claim 1, since an inlet valve and an exhaust valve control the reverse tumble flow from an inlet valve located in the center at the valve-overlap period currently opened to coincidence, the scavenging efficiency by the order

tumble flow of the side improves. And since an inlet valve and an exhaust valve supply supercharge air by actuation of a supercharger at the valve-overlap period currently opened to coincidence, the temperature of a combustion chamber can be lowered, knocking-proof nature can be raised, a compression ratio can be raised by this and thermal efficiency can be raised.

[0013] Phase contrast is given to the closing motion timing of an inlet valve located in the center, and the closing motion timing of an inlet valve located in the side, for example, the order tumble flow of the side can be strengthened with invention according to claim 2, a strong scavenging-air style can be generated, and scavenging efficiency improves. And since an inlet valve and an exhaust valve supply supercharge air by actuation of a supercharger at the valve-overlap period currently opened to coincidence, the temperature of a combustion chamber can be lowered, knocking-proof nature can be raised, a compression ratio can be raised by this and thermal efficiency can be raised.

[0014] Closing motion timing of an inlet valve located in the side from the closing motion timing of an inlet valve located in the center in invention according to claim 3 can be carried out early, phase contrast can be given, a valve-overlap period has been set up with the inlet valve and exhaust valve which are located in the side, supercharge air can be positively supplied from inhalation-of-air opening of the side, the order tumble flow of the strong forward direction can be formed, and the scavenging-air effectiveness can be raised by opening the inlet valve of the side earlier than a central inlet valve.

[0015] Moreover, toward central inhalation-of-air opening, by injecting a fuel, a rich mixture can be made to be able to form in the circumference of the ignition plug set in the center of a combustion chamber, and, thereby, it can lean-burn-ize.

[0016] In invention according to claim 4, the inhalation-of-air path was equipped with the fuel injector which injects a fuel, the fuel injection of this fuel injector is started from near at the termination time of a bulb overlap period, the scavenging-air effectiveness can be secured, preventing the blow by to a flueway, and improvement in fuel consumption and clean-ization of exhaust gas can be attained.

[0017]

[Example] Hereafter, the example of the suction system of an engine equipped with the supercharger of this invention is explained based on a drawing. Drawing showing the engine with which drawing 1 is equipped with a supercharger, the sectional view of the engine with which drawing 2 is equipped with a supercharger, the top view of the engine with which drawing 3 is equipped with a supercharger, and drawing 4 are drawings showing the closing motion timing of an exhaust valve, the closing motion timing of an inlet valve, and fuel-injection timing.

[0018] The fuel-injection type engine of a 4-cylinder is used, the exhaust air system 3 is formed in one side, and, as for the engine 2 equipped with this supercharger 1, the

inhalation-of-air system 4 is formed in another side. The exhaust pipe 5 of the exhaust air system 3 is connected to the gas column of an engine 2, respectively.

[0019] An air cleaner 8 and an air flow meter 9 are formed in the upstream of the inlet pipe 7 which the surge tank 6 of the inhalation-of-air system 4 was connected to the gas column of an engine 2, respectively, and was connected to the surge tank 6, a throttle valve 10 is formed in the downstream of an air flow meter 9, the supercharge control bulb 11 is further formed in the downstream of a throttle valve 10, respectively, and the supercharge control bulb 11 is located in the inlet port of a surge tank 6.

[0020] It is open for free passage with the exhaust air return tubing 12, and control of EGR valve 13 with which this exhaust air return tubing 12 was equipped is equipped with the EGR system 28 which returns a part of exhaust gas to a surge tank 6, and an exhaust pipe 5 and a surge tank 6 mitigate the nitrogen oxides of exhaust air by actuation of this EGR system 28.

[0021] Moreover, between a throttle valve 10 and the supercharge control bulb 11, a supercharger 1 is connected through the supercharge close by-pass 14, and this supercharger 1 is connected to the surge tank 6 through the supercharge appearance by-pass 16. The supercharge inlet valve 17 is formed in the supercharge close by-pass 14, and the supercharge close by-pass 14 of the downstream of this supercharge inlet valve 17 is opened for free passage with the supercharge appearance by-pass 16 through the by-path pipe 18. A bypass valve 19 is formed in this by-path pipe 18, and the intercooler 20 to cool is further formed in the supercharge appearance by-pass 16.

[0022] The pulley 21 of a supercharger 1 is connected with the pulley 23 of an engine 2 through a belt 22, and it drives because a supercharger 1 connects the supercharge clutch 24 with the power of an engine 2.

[0023] Next, actuation of the engine 2 equipped with this supercharger 1 is explained. The engine 2 equipped with a supercharger 1 operates by the stroke of an accelerator 30.

[0024] That is, the stroke of an accelerator 30 of the field from an A point to C point is the operating state of a low load region. This low load region is a field to C point which a bypass valve 19 closes and the supercharge inlet valve 17 opens. The supercharge inlet valve 17 of the supercharge close by-pass 14 is a close by-pass bulb completely, and a bypass valve 19 is full open.

[0025] Although the supercharge clutch 24 turns [the stroke of an accelerator 30] on in a B point, the supercharge inlet valve 17 of the supercharge close by-pass 14 is a close by-pass bulb completely, and a bypass valve 19 is full open, and although a supercharger 1 is in a drive condition, it does not have air compression.

[0026] Moreover, the supercharge control bulb 11 is opened fully, and the output of an engine 2 is controlled only by the throttle valve 10. At this time, EGR valve 13 opens and the EGR system 28 operates.

[0027] Next, the stroke of an accelerator 30 of the field from C point to E points is the operating state of a supercharge control bulb partialness region. A bypass valve 19

closes this supercharge partialness region, and it is a field which the supercharge inlet valve 17 controls by full open to close according to near the open position of a throttle valve 10 to an accelerator stroke becoming [the supercharge control bulb 11] large. The supercharge inlet valve 17 of the supercharge close by-pass 14 is opened fully, and a bypass valve 19 is a close by-pass bulb completely, the supercharger 1 of the supercharge clutch 24 is in a drive condition in ON, and air compression is performed. [0028] Moreover, in the output of an engine 2, a throttle valve 10 is opened fully at the stroking point T2, the supercharge control bulb 11 is controlled to close at Saki's stroking point t1 from the stroking point t2, and air compression is performed by the drive of this supercharger 1. At this time, EGR valve 13 opens and the EGR system 28 operates.

[0029] Next, the stroke of an accelerator 30 of the field of E points is the operating state of a supercharge control bulb close-by-pass-bulb-completely region. A bypass valve 19 closes this supercharge control bulb close-by-pass-bulb-completely region, the supercharge inlet valve 17 is full open, and the supercharge control bulb 11 is the field of a close by-pass bulb completely. The supercharge inlet valve 17 of the supercharge close by-pass 14 is opened fully, and since the supercharge clutch 24 is ON, as for a supercharger 1, air compression is performed in the state of a drive.

[0030] Moreover, the throttle valve 10 is opened fully, the supercharge control bulb 11 is a close by-pass bulb completely, and the output of an engine 2 obtains high power by charge pressure. At this time, EGR valve 13 closes and the EGR system 28 does not operate.

[0031] As shown in drawing 2 and drawing 3, the engine 1 equipped with this supercharger sandwiches ignition BURAGU 34, and has three inlet valves 38 on two exhaust valves 37 and another side in one side, two exhaust air opening 35a which carried out opening to the combustion chamber 33 of a flueway 35 is opened and closed with each exhaust valve 37, and this two exhaust air opening 35a is arranged along with the periphery of a combustion chamber 33. Path 35b from two exhaust air openings 35a joins by the downstream, and the flueway 35 is one path.

[0032] It is opened and closed by each inlet valve 38 by three inhalation-of-air opening 36a which carried out opening to the combustion chamber 33 of the inhalation-of-air path 36, and this three inhalation-of-air opening 36a is arranged along with the periphery of a combustion chamber 33. One path branches to three paths 36b by the downstream by the upstream, and, as for the inhalation-of-air path 36, each path 36b is connected to three inhalation-of-air opening 36a.

[0033] It is arranged so that the fuel injector 49 may inject a fuel from the upper wall of the inhalation-of-air path 36 from tee 36c of the inhalation-of-air path 36 toward inhalation-of-air opening 36a to the upstream.

[0034] As shown in drawing 4 among three inlet valves 38, phase contrast T1 is given to the closing motion timing of an inlet valve 38 located in the center, and the closing

motion timing of an inlet valve 38 located in the side. Thus, by forming phase contrast T1 in closing motion timing, as shown in drawing 2, from the reverse tumble flow from inhalation-of-air opening 36a by the inlet valve 38 located in the center opening, the order tumble flow of the side from inhalation-of-air opening 36a by the inlet valve 38 located in the side opening early can become strong, this strong scavenging-air style can be generated, and scavenging efficiency improves.

[0035] An inlet valve 38 and an exhaust valve 37 as a means for raising such scavenging efficiency at in addition, the valve-overlap period currently opened to coincidence It can have a control means to control the reverse tumble flow from an inlet valve 38 located in the center. This control means For example, the path of an inlet valve 38 located in the center is made smaller than the path of an inlet valve 38 located in the side. Moreover, the regulation valve which open upwards to the central inhalation-of-air path bottom, it is made to carry out current transformation of the flow of inhalation of air, and is led to an exhaust air opening side with it at the time of scavenging air as indicated to Japanese Patent Application No. No. 005202 [five to] for which these people applied previously, for example is prepared, and you may make it regulate a reverse tumble flow.

[0036] Moreover, since an inlet valve 38 and an exhaust valve 37 supply supercharge air by actuation of a supercharger 1 at the valve-overlap period T2 currently opened to coincidence, the temperature of a combustion chamber 33 can be lowered and knocking-proof nature can be raised. Thus, by improvement in knocking-proof nature, a compression ratio can be raised and thermal efficiency improves.

[0037] As shown in drawing 4, from moreover, the closing motion timing of an inlet valve 38 located in the center Carry out closing motion timing of an inlet valve 38 located in the side early, and phase contrast T1 is given. By having set up the valve-overlap period T2 with the inlet valve 38 and exhaust valve 37 which are located in the side, and opening the inlet valve 38 of the side earlier than the central inlet valve 38 Supercharge air can be positively supplied from inhalation-of-air opening 36a of the side, the order tumble flow of the strong forward direction can be formed, and the scavenging-air effectiveness can be raised.

[0038] Moreover, as shown in drawing 3, with the fuel injector 49, by injecting a fuel toward central inhalation-of-air opening 36a, a rich mixture can be formed in the circumference of the ignition plug 34 set in the center of a combustion chamber 33, and, thereby, it can lean-burn-ize.

[0039] Moreover, the inhalation-of-air path 36 is equipped with the fuel injector 49 which injects a fuel, the fuel injection of this fuel injector 49 is started from near at the termination time of the bulb overlap period T2, as shown in drawing 4, the scavenging-air effectiveness can be secured, preventing the blow by to a flueway 35, and improvement in fuel consumption and clean-ization of exhaust gas can be attained.

[0040]

[Effect of the Invention] As described above, since an inlet valve and an exhaust valve control the reverse tumble flow from an inlet valve located in the center at the valve-overlap period currently opened to coincidence, the scavenging efficiency of according to claim 1 invention by the order tumble flow of the side improves. And since an inlet valve and an exhaust valve supply supercharge air by actuation of a supercharger at the valve-overlap period currently opened to coincidence, the temperature of a combustion chamber can be lowered, knocking-proof nature can be raised, a compression ratio can be raised by this and thermal efficiency can be raised.

[0041] Since invention according to claim 2 gave phase contrast to the closing motion timing of an inlet valve located in the center, and the closing motion timing of an inlet valve located in the side, it can strengthen the order tumble flow of the side, for example, and can generate a strong scavenging-air style, and its scavenging efficiency improves. Moreover, since an inlet valve and an exhaust valve supply supercharge air by actuation of a supercharger at the valve-overlap period currently opened to coincidence, the temperature of a combustion chamber can be lowered, knocking-proof nature can be raised, a compression ratio can be raised by this and thermal efficiency can be raised.

[0042] Since it carried out closing-motion timing of an inlet valve located in the side early and gave phase contrast from the closing-motion timing of an inlet valve located in the center, invention according to claim 3 sets up a valve-overlap period with the inlet valve and the exhaust valve which are located in the side, it can supply supercharge air positively from inhalation-of-air opening of the side, can form the tumble flow of the strong forward direction, and can raise the scavenging-air effectiveness by opening the inlet valve of the side earlier than a central inlet valve.

[0043] Moreover, toward central inhalation-of-air opening, by injecting a fuel, a rich mixture can be made to be able to form in the circumference of the ignition plug set in the center of a combustion chamber, and, thereby, it can lean-burn-ize.

[0044] Since invention according to claim 4 equipped the inhalation-of-air path with the fuel injector which injects a fuel and started the fuel injection of this fuel injector from near at the termination time of a bulb overlap period, it can secure the scavenging-air effectiveness, preventing the blow by to a flueway, and can attain improvement in fuel consumption, and clean-ization of exhaust gas.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing an engine equipped with a supercharger.

[Drawing 2] It is the sectional view of an engine equipped with a supercharger.

[Drawing 3] It is the top view of an engine equipped with a supercharger.

[Drawing 4] It is drawing showing the closing motion timing of an exhaust valve, the closing motion timing of an inlet valve, and fuel-injection timing.

[Description of Notations]

1 Supercharger

2 Engine

33 Combustion Chamber

35 Flueway

35a Exhaust air opening

36 Inhalation-of-Air Path

36a Inhalation-of-air opening

37 Exhaust Valve

38 Inlet Valve

T1 Phase contrast of inhalation-of-air valve-opening close timing

T2 Valve-overlap period

[Translation done.]